Name:_____

Experiment 11: Half-Life Calculations

Purpose:

The purpose of this lab is to understand the statistical nature of half-life calculations.

Introduction:

Many people have heard the term "half-life" and know that it is related to radioactive elements. This lab will help you understand exactly what is meant by half-life and how scientists use this idea to better understand the nucleus and radioactivity.

Procedure:

1. You will be given a sample of a radioactive element known as M&Mium. Radioactive members of this isotope family are easily distinguished by the bold M&M emblazoned across the front of the atom. Particle physicists are at a loss as to why the radioactive members of the species have this ….perhaps you have a hypothesis?
2. Place all the members of the family in a cup, **MAKING SURE ALL THE ATOMS HAVE THE M&M LOGO UP SO YOU CAN READ IT!!** Count the atoms as you place them in the box and record the total number you start with in a data table in your notebook.
3. Next, holding your hand on the cup opening, **shake the cup once only, and pour all the atoms on the table**. You will notice that several of the previously radioactive elements have decayed, and the M&M is no longer visible. This means that they are now considered "safe" and, since they are no longer radioactive, may actually be eaten without fear of any harm to you. Please do so, sharing with your partner, and as you remove the edible atoms, **count them so you may determine the number of atoms that have decayed in that particular shake.**
4. Place the remaining radioactive elements in your cup, M&M logos facing up, and continue as before until no radioactive atoms remain. **Be sure to record the decayed atoms after each shake.**

Analysis:

1. Plot a graph of N (number of undecayed atoms) as a function of the number of shakes on both a

   normal sheet of graph paper and a semilog sheet of graph paper(supplied).

2. Determine the half-life of your graph on normal paper and record here:_____

Data:

Number of shakes	Number of undecayed MM's
0	
1	
2	
3	
4	
6	
6	
7	
8	
9	
10	

Questions:

1. Explain why the graph is curved rather than a straight line, when graphed on a normal sheet of graph paper.

2. Cs-137 has a half-life of 30 years. How many years will it take for 28 g of Cs-137 to decay to 3.5 g?